

What kinds of processes or events might cause the Earth's climate to change?

Pollution

Clouds

CO₂

the heat of the sun

Hurricane / natural disasters

Water vapor / evaporation

pavement

buildings

Climate Change Unit

End Product (Unit Assessment)

After reading informational texts and examining climate change models, write a climate assessment report in which you discuss the current impacts of climate change on Earth's systems and evaluate which future predictions are most likely. What conclusions can you draw about possible response strategies to address the impact of climate change? Support your position with evidence from the text/s. Be sure to acknowledge competing views. Include charts to help convey your message to your readers.

Climate Change Unit

Activity 1 p. E84

I Will Be Able To (IWBAT) describe the climate of my community through looking at temperature and precipitation data and determine what physical features in my community influence the local climate by looking at topographic maps. I will demonstrate my understanding in discussions with partners and written responses to prompts using vocabulary such as temperature, precipitation, and elevation.

Seré capaz de describir el clima de mi comunidad a través de la observación de los datos de temperatura y precipitación y determinará qué características físicas de mi comunidad influyen en el clima local al observar los mapas topográficos. Demostraré mi comprensión en las discusiones con los socios y las respuestas escritas a las preguntas utilizando vocabulario como la temperatura, la precipitación y la elevación.

Climate Change Unit

Activity 1 p. E84

In Schoology, course Earth Science 2, folder Unit 6 Climate Change, folder Week 1, folder Activity 1,

- 1. proceed to the assignment Climate Change Activity 1 Notes & Questions,**
- 2. open the attached document,**
- 3. complete the What do you see? and What do you think? sections,**
- 4. discuss your results as a table, and**
- 5. complete Parts A & B of the Investigate with a partner.**

En Schoology, curso Earth Science 2, carpeta Unidad 6 Cambio climático, carpeta Semana 1, carpeta Actividad 1,

- 1. proceder a la tarea Actividad 1 sobre Cambio Climático, Notas y Preguntas,**
- 2. abra el documento adjunto,**
- 3. completa el ¿Qué ves? ¿y, qué piensas? secciones,**
- 4. discuta sus resultados como una tabla, y**
- 5. complete las Partes A y B de Investigar con un compañero.**

IWBAT describe the climate of my community through looking at temperature and precipitation data and determine what physical features in my community influence the local climate by looking at topographic maps.

Climate Change Unit

Activity 1 p. E91

Digging Deeper

- Weather is the state of the atmosphere day-to-day, week-to-week. Climate is the typical or average weather on a long-term basis. There are several important factors that influence climate: latitude, elevation, & nearby geographic features.
- Latitude is a measure of the distance away from the equator expressed as degrees from 0 at the equator to 90 at the poles. Temperatures decrease 1 deg F for every 3 deg in latitude away from the equator. The amount of solar energy an area receives depends on its latitude: closer to the equator receives more (overhead sun) and closer to the poles receives less (low sun/no sun).
- Elevation (height above sea level) also affects climate. On average temperatures decrease 3.6 deg F per 1000 ft of elevation gained. Many places at high elevations form glaciers because summers are too cool to melt snow.
- Geographic features like mountains, lakes, and oceans affect a region's climate. The windward side of a mountain chain often receives much more rain than the leeward side. The leeward side of a mountain range has a rain shadow. On the leeward side of the mountains the air warms as pressure increases, lower humidity.
- Large bodies of water can affect climate regionally. Temperatures of coastal communities vary less than inland communities of a similar latitude. Water has a much higher heat capacity than soil and rock. It takes much more energy to heat water than rock for the same change in temperature.

IWBAT describe the effects of local geography on local climate. I will demonstrate my understanding in class discussions and written responses using vocabulary such as latitude, temperature, precipitation, and elevation.

Climate Change Unit

Activity 1 p. E91

Digging Deeper

- Cool winds accumulate moisture from the still-warm lake as they blow across. Over the cold land, the water precipitates out as snow. Warm oceans supply the water for major rainstorms along the coast and far inland in the eastern US.
- Global climate is the climate of the entire Earth usually expressed as the average year-round temperature, though rainfall is an important factor. The time from the mid-1300s to the mid-1800s is called the Little Ice Age and the temperatures were about 3 deg F colder than today. Today's average temperature is 60 deg F, but the climate has continually changed over Earth's history.

IWBAT describe the effects of local geography on local climate. I will demonstrate my understanding in class discussions and written responses using vocabulary such as latitude, temperature, precipitation, and elevation.

IWBAT investigate and understand the significance of tree rings, glacial ice cores, fossil pollen, and geologic and glacial sediments as indicators of environmental change. I will do this via small group and partner discussions, shared reading, written notes, and responding to questions using vocabulary such as sediment, climate, and pollen.

Podré investigar y comprende la importancia de los anillos de los árboles, los núcleos de hielo glacial, el polen fósil y los sedimentos geológicos y glaciales como indicadores del cambio ambiental. Haré esto a través de discusiones en grupos pequeños y parejas, lectura compartida, notas escritas y respuestas a preguntas usando vocabulario como sedimentos, clima y polen.

Climate Change Unit
Activity 2 p. E96

In Schoology, course Earth Science 2, folder Unit 6 Climate Change, folder Week 2, folder Activity 2,

- 1. proceed to the assignment Climate Change Activity 2 Notes & Questions,**
- 2. open the attached document,**
- 3. complete the What do you see? and Think about it sections,**
- 4. discuss your results as a table, and**
- 5. be prepared to discuss as a whole class.**

En Schoology, curso Earth Science 2, carpeta Unidad 6 Cambio climático, carpeta Semana 2, carpeta Actividad 2,

- 1. proceder a la tarea Actividad 2 sobre Cambio Climático, Notas y Preguntas,**
- 2. abra el documento adjunto,**
- 3. completa el ¿Qué ves? y Piénsalo secciones,**
- 4. discuta sus resultados como una tabla, y**
- 5. prepárate para discutir como una clase completa**

IWBAT investigate and understand the significance of tree rings as indicators of environmental change.

Climate Change Unit

Activity 2 p. E96

After the discussion:

- **Complete Parts A & B of the Investigate with a partner.**
- **The diagrams for Part A are available in the Activity 2 folder.**
- **The clay for Part B is on top of tan cabinet 9-12.**
- **The drawing in 2a may be done via Insert -> Drawing or you may do it on paper and then insert an image of that drawing into your document.**

Después de la discusión:

- **Complete las Partes A y B de Investigar con un compañero.**
- **Los diagramas para la Parte A están disponibles en la carpeta de la Actividad 2.**
- **La arcilla para la Parte B está encima del armario tostado 9-12.**
- **El dibujo en 2a se puede hacer a través de Insertar -> Dibujar o puede hacerlo en papel y luego insertar una imagen de ese dibujo en su documento.**

IWBAT investigate and understand the significance of tree rings and fossil pollen as indicators of environmental change.

Climate Change Unit

Activity 2 p. E99

Digging Deeper

- A paleoclimate is a climate that existed sometime in the past. At present the Earth is experiencing an interglacial interval.
- The last retreat of continental glaciers was 20,000-8,000 years ago. For certain places, written climate records extend back 2,000 years. Paleoclimatologists use a variety of methods to infer past climates. Evidence gives a picture of Earth's climatic history.
- Many types of evidence give an *indirect* record of past temperatures and are called climate proxies. A proxy is something that represents something else indirectly. Nothing gives a direct reading of past temperature. No climate proxies are perfect.
- Pollen consists of tiny particles produced in flowers to make seeds. Pollen is often preserved in lake or bog sediments. A layer of sediment may contain a lot of pollen from spruce trees indicating that the climate was cold while the layer of sediment was being deposited. Geologists make charts of the number of pollen grains and types found in different layers to give an idea of climate changes.
- The long ice core from Antarctica provides a record of climate that goes back more than 400,000 years. Drilling ice cores from glaciers has become a powerful tool for studying paleoclimate.

IWBAT investigate and understand the significance of tree rings, glacial ice cores, fossil pollen, and geologic and glacial sediments as indicators of environmental change.

Climate Change Unit

Activity 2 p. E96

Digging Deeper

- Almost all oxygen atoms in the atmosphere come in two isotope forms: ^{16}O & ^{18}O . They are the same chemically, but ^{18}O is slightly heavier than ^{16}O . Snow that falls during warmer global climate contains a greater proportion of ^{18}O and a smaller proportion during cooler climates. Another way is to measure the proportions of 1-H and 2-H. These ratios can be measured very accurately using special instruments.
- The amount of CO_2 in the atmosphere correlates to global temperatures; warmer temperatures correlate with greater CO_2 concentrations in the atmosphere as compared to cold climates. CO_2 measurements from the ice cores paint a global picture because CO_2 is uniformly distributed in the global atmosphere.
- A third component of the ice that yields clues to paleoclimates is dust, because winds are stronger and erode more during colder climates.
- During warmer climates, the shells of foraminifera spiral in one direction, but in cold climates they spiral in the other direction. The shells can be studied for their proportions of the two oxygens.
- Glaciers erode the rock beneath, carry the sediment, and deposit it into distinctive land forms. Fine glacier sediment is picked up by the wind and deposited as loess. Loess layers show several periods of glaciation during the Pleistocene Epoch. When ice bergs break off of glaciers (calve), they melt and deposit coarse sediment on the ocean bottoms.

IWBAT investigate and understand the significance of tree rings, glacial ice cores, fossil pollen, and geologic and glacial sediments as indicators of environmental change.

Climate Change Unit

Activity 2 p. E96

Digging Deeper

- Trees grow more during warm years than cold years, helping record paleoclimate. Few trees live long enough to provide a long window on paleoclimate. Bristlecone pine and giant sequoias are two who do.

IWBAT investigate and understand the significance of tree rings, glacial ice cores, fossil pollen, and geologic and glacial sediments as indicators of environmental change.

Writing prompt:
Week 2 folder

Solicitud de escritura:
Carpeta de la semana 2

IWBAT investigate and understand the influence of the tilt of the Earth's axis on the seasons and the shape of the Earth's orbit around the sun on climate. I will do this via small group and partner discussions, shared reading, written notes, and responding to questions using vocabulary such as axis, rotation, and orbit.

Podré investigar y comprender la influencia de la inclinación del eje de la Tierra sobre las estaciones y la forma de la órbita de la Tierra alrededor del sol sobre el clima. Haré esto a través de discusiones en grupos pequeños y parejas, lectura compartida, notas escritas y respuestas a preguntas utilizando vocabulario como eje, rotación y órbita.

Climate Change Unit

Activity 3 p. E105

In Schoology, course Earth Science 2, folder Unit 6 Climate Change, folder Week 3, folder Activity 3,

1. proceed to the assignment Climate Change Activity 3 Notes & Questions,
2. open the attached document,
3. complete the What do you see? and Think about it sections,
4. discuss your results as a table, and
5. be prepared to discuss as a whole class.

En Schoology, curso Earth Science 2, carpeta Unidad 6 Cambio climático, carpeta Semana 3, carpeta Actividad 3,

1. proceder a la tarea Actividad 3 sobre Cambio Climático, Notas y Preguntas,
2. abra el documento adjunto,
3. completa el ¿Qué ves? y Piénsalo secciones,
4. discuta sus resultados como una tabla, y
5. prepárate para discutir como una clase completa

IWBAT investigate and understand the influence of the tilt of the Earth's axis on the seasons and the shape of the Earth's orbit around the sun on climate.

Climate Change Unit

Activity 3 p. E105

After the discussion:

- Complete Parts A2 through E of the Investigate with a partner.
- The diagrams for Part A are available on the tan cabinet.
- The materials for the succeeding parts are on the tan cabinet, as well.
- Part D: We will attempt to do this in the plaza on Thursday.

Después de la discusión:

- Complete las Partes A2 a E de Investigar con un compañero.
- Los diagramas para la Parte A están disponibles en el armario café.
- Los materiales para las partes siguientes también están en el armario café.
- Parte D: Intentaremos hacer esto en la plaza el jueves.

IWBAT investigate and understand the influence of the tilt of the Earth's axis on the seasons and the shape of the Earth's orbit around the sun on climate.

Climate Change Unit

Activity 3 p. E105

Digging Deeper

- The Earth's axis is tilted at about 23.5 degrees from perpendicular to the plane of its orbit
- The summer solstice is on/about June 22; the winter solstice is on/about Dec. 22
- When the axis is tilted toward the sun it's summer; when it's tilted away it's winter
- Variations in the Earth's orbit around the sun are the major cause of the large variations in Earth's climate which cause the advance/retreat of ice sheets
- The tilt of Earth's axis and its orbit would remain exactly the same if the Earth and the sun were the only two bodies in the solar system
- The Earth's orbital parameters are eccentricity, obliquity, and precession.
- The Earth's orbit around the sun is an ellipse. A circle is an ellipse with zero eccentricity; Earth's orbit has a slight eccentricity.
- The distance from the Earth to the sun varies by about 3.3% per year. Insolation describes the rate of the sun's energy hitting the side of the Earth facing the sun directly. The seasonal difference in insolation is due to the inverse square law and is about 7 degrees between closest and farthest positions relative to the sun.
- Earth's orbital eccentricity changes with time. One cycle of increase & decrease takes 100,000 years. The insolation can range from 2 deg less than now to 20 deg more than now.

IWBAT investigate and understand the influence of the tilt of the Earth's axis on the seasons and the shape of the Earth's orbit around the sun on climate.

Climate Change Unit

Activity 3 p. E105

Digging Deeper

- Earth's axis is oblique to the plane of orbit rather than perpendicular to it. A change in the obliquity would change the nature of the seasons.
- The maximum angle of axial tilt is about 24.5 deg and the minimum is about 22 deg. The obliquity cycle is about 40,000 years long.
- The gravitational pull of the sun, moon, and other planets causes a slow wobble in Earth's axis - axial precession. This has a period of about 26,000 years.
- The interaction of orbital precession with eccentricity and axial precession is important in determining climates.
- Earth's climates are caused by how insolation varies with latitude and time.
- Temperature variations seem to have been controlled by the 100,000 year eccentricity cycle at some times, but by the 41,000 year obliquity cycle at other time intervals during the 420,000 year Antarctic ice core record.
- What makes paleoclimatology is that many factors interact in complicated ways to produce climate. Many important climate mechanisms must be taken into account: evaporation, precipitation, snowfall, snowmelt, cloud cover, vegetation, greenhouse gases, and sea level.

IWBAT investigate and understand the influence of the tilt of the Earth's axis on the seasons and the shape of the Earth's orbit around the sun on climate.

IWBAT understand how ocean currents are affected by Earth's moving plates. I will do this through interpreting maps and participating in class discussion. I will demonstrate my understanding through orally answering questions and correctly using vocabulary such as climate and currents.

Podré entender cómo las corrientes oceánicas se ven afectadas por las placas móviles de la Tierra. Haré esto a través de la interpretación de mapas y la participación en la discusión en clase. Demostraré mi comprensión a través de preguntas que responden oralmente y el uso correcto de vocabulario como el clima y las corrientes.

Climate Change Unit
Activity 4 p. E117

In Schoology, course Earth Science 2, folder Unit 6 Climate Change, folder Week 4, folder Activity 4,

- 1. proceed to the assignment Climate Change Activity 4 Notes & Questions,**
- 2. open the attached document,**
- 3. complete the What do you see? and Think about it sections,**
- 4. discuss your results as a table, and**
- 5. be prepared to discuss as a whole class.**

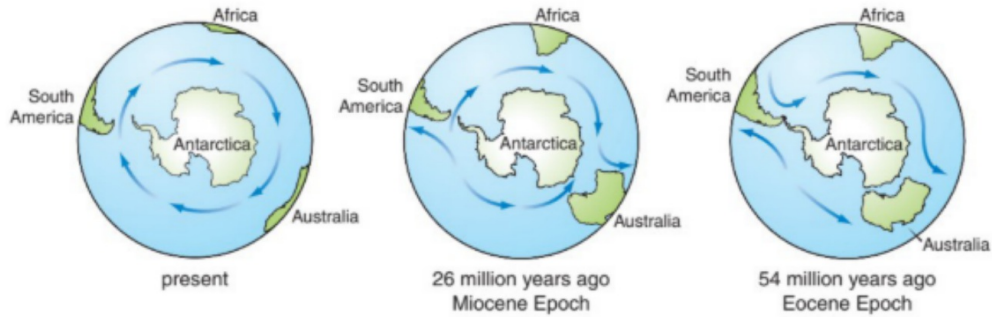
En Schoology, curso Earth Science 2, carpeta Unidad 6 Cambio climático, carpeta Semana 4, carpeta Actividad 4,

- 1. proceder a la tarea Actividad 4 sobre Cambio Climático, Notas y Preguntas,**
- 2. abra el documento adjunto,**
- 3. completa el ¿Qué ves? y Piénsalo secciones,**
- 4. discuta sus resultados como una tabla, y**
- 5. prepárate para discutir como una clase completa**

IWBAT understand how ocean currents are affected by Earth's moving plates

Climate Change Unit

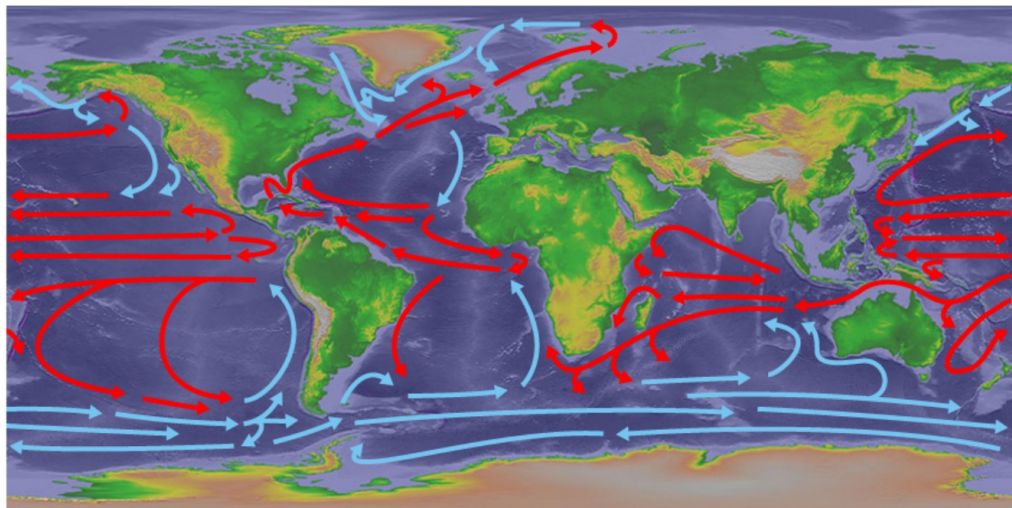
Activity 4 p. E117



IWBAT understand how ocean currents are affected by Earth's moving plates

Climate Change Unit

Activity 4 p. E117



IWBAT understand how ocean currents are affected by Earth's moving plates

Climate Change Unit

Activity 4 p. E120

Digging Deeper

- A community near an ocean has a more moderate climate than one inland at the same latitude because water has a higher heat capacity than rocks/soil. A community near a cold ocean current has a cooler climate than one near a warm ocean current.
- The equator receives more solar radiation than the poles. Winds transfer heat from low latitudes to high latitudes. The flow of the North Atlantic Deep Water helps transfer heat from the equator to the poles. This slow circulation is like a conveyor belt for transferring heat. When the conveyor belt is disturbed, the entire global climate is affected.
- The arrangement of the continents has a strong effect on the Earth's climate. Where oceans occupy polar areas, accumulation of snow is limited by melting in the salty water. Large land areas at high latitudes are conducive to the accumulation of snow and glacier formation.
- About 200 million years ago, Earth's continents were welded together into a supercontinent called Pangea. At present most of Earth's continental land mass is in the Northern Hemisphere. Ice sheets can form during the parts of the Milankovitch cycles which are conducive to lower global temperatures. During warmer periods, the North American and Eurasian ice sheets have melted away completely. In the Southern Hemisphere there is not enough continental land mass for large glaciers to form except for Antarctica.

IWBAT understand how ocean currents affect regional and global climates.

Climate Change Unit

Activity 4 p. E117

Digging Deeper

- Plate tectonics affect global climate in other ways besides moving the continents. Increased volcanic activity releases CO₂ which is a gas that traps heat in the atmosphere. This can cause the climate to warm. These eruptions add dust to the atmosphere blocking solar radiation and decreasing global temperatures.
- Many scientists believe that the weathering of mountain ranges uses up CO₂ from Earth's atmosphere. This causes global climate to cool.

IWBAT understand how ocean currents affect regional and global climates.

IWBAT compare data to understand the relationship of carbon dioxide to global temperature, evaluate the data to draw a conclusion, and recognize a pattern of information in a graph in order to predict future temperature. I will do this through constructing and interpreting graphs with a partner.

Podré comparar datos para comprender la relación entre el dióxido de carbono y la temperatura global, evaluar los datos para llegar a una conclusión y reconocer un patrón de información en un gráfico para predecir la temperatura futura. Lo haré construyendo e interpretando gráficos con un compañero.

Climate Change Unit
Activity 5 p. E125

In Schoology, course Earth Science 2, folder Unit 6 Climate Change, folder Week 5, folder Activity 5,

- 1. proceed to the assignment Climate Change Activity 5 Notes & Questions,**
- 2. open the attached document,**
- 3. complete the What do you see? and Think about it sections,**
- 4. discuss your results as a table, and**
- 5. be prepared to discuss as a whole class.**

En Schoology, curso Earth Science 2, carpeta Unidad 6 Cambio climático, carpeta Semana 5, carpeta Actividad 5,

- 1. proceder a la tarea Actividad 5 sobre Cambio Climático, Notas y Preguntas,**
- 2. abra el documento adjunto,**
- 3. completa el ¿Qué ves? y Piénsalo secciones,**
- 4. discuta sus resultados como una tabla, y**
- 5. prepárate para discutir como una clase completa**

IWBAT compare data to understand the relationship of carbon dioxide to global temperature, evaluate the data to draw a conclusion, and recognize a pattern of information in a graph in order to predict future temperature.

Climate Change Unit

Activity 5 p. E125

After the discussion:

- **Complete Parts A and B of the Investigate with a partner.**
- **The graph paper for for Part A is available on the tan cabinet.**
- **There is a handout of the graph for Part B.**
- **We are not doing Part C.**

Después de la discusión:

- Complete las Partes A y B de Investigar con un compañero.
- El papel cuadriculado para la Parte A está disponible en el armario café.
- Hay un folleto del gráfico para la Parte B.
- No estamos haciendo la Parte C.

IWBAT compare data to understand the relationship of carbon dioxide to global temperature, evaluate the data to draw a conclusion, and recognize a pattern of information in a graph in order to predict future temperature.

Climate Change Unit

Activity 5 p. E128 Digging Deeper

- When there is more CO₂ in the atmosphere, temperatures are higher; when there is less CO₂, temperatures are lower. Three possibilities: CO₂ affects temp., temp. affects CO₂, both are affected by a third factor and are independent of each other. CO₂ is a greenhouse gas (GHG). A correlation does not prove cause and effect.
- The Earth is warm enough to support life because the atmosphere contains GHGs that let sunlight pass through and absorb a portion of the energy traveling from Earth toward space. Water vapor is the most important GHG. Methane (CH₄) and nitrogen oxides (NO_x) are also GHGs. Without GHGs the Earth would be a frozen wasteland.
- Solar radiation is absorbed by Earth's surface, GHGs, or reflected back to space. Most solar radiation passes through the atmosphere without being absorbed unless it's reflected by the clouds first. The wavelength of radiation depends on the object's surface temperature: the hotter the temperature, the shorter the wavelength. The much cooler surface of the Earth radiates energy at much longer wavelengths (visible, infrared, etc.).
- GHGs absorb most of the outgoing infrared radiation. The reradiate some of this absorbed energy back to the Earth.
- CO₂ is put into the atmosphere in many ways including volcanic eruptions & the oxidation of organic matter (burning of fossil fuels, decay of plant & animal tissue). When you breathe you take in O₂ which you use to oxidize your food and breathe out CO₂. CO₂ is released into the atmosphere when people burn wood and fossil fuels like coal, natural gas, and oil.

IWBAT compare data to understand the relationship of carbon dioxide to global temperature, evaluate the data to draw a conclusion, and recognize a pattern of information in a graph in order to predict future temperature.

Climate Change Unit

Activity 5 p. E128 Digging Deeper

- CO₂ is constantly on the move from place to place. The only way to remove it from the active cycle is to bury it deeply with sediments. CO₂ is constantly being transformed from one form to another.
- It appears that the more CO₂ there is in the atmosphere, the warmer global temperatures are. On a scale of hundreds of thousands of years, CO₂ and global temperatures track each other very closely. The periodicity follows the Milankovitch cycles. On a scale of centuries, however, it appears that the increase in CO₂ has been at least a part of the cause for the increase in global warming.
- For a long time humans have been adding CO₂ to the atmosphere by the burning of fossil fuels and it has increased over the past couple of centuries. Scientists are concerned about the increase in CO₂ in the atmosphere causing the increase in global temperatures. Before the industrial Revolution CO₂ was at 300ppm but had risen to 360ppm by 1995.
- Many nations have a commitment to reduce the amount of GHGs produced. Some people believe that the increase in CO₂ should be reduced despite the size of CO₂'s contribution being uncertain. Others think that it would be unwise to disrupt the present global economy. The big problem is that no one is certain that rapid global warming will take place. If it does, it may be too late to do anything about it.
- Some CO₂ released by burning fossil fuels is absorbed by the ocean. Some people have suggested storing CO₂ in the ocean - postponing the problem generations. Reforestation also stores CO₂ on previously cleared farm land. By some estimates, the US is a sink rather than a source of CO₂.

IWBAT compare data to understand the relationship of carbon dioxide to global temperature, evaluate the data to draw a conclusion, and recognize a pattern of information in a graph in order to predict future temperature.

Climate Change Unit

Activity 6 p. E136

IWBAT brainstorm ways climate change might affect the Earth and my community, design an experiment on paper to test my ideas, explain some of the effects of global warming, understand positive and negative feedback loops, and understand and evaluate the limitations of models in studying climate change through time. I will do this through group discussion, creating a poster, and writing down an experiment design on paper which could test an aspect of climate change. I will use vocabulary such as precipitation, plant life, and atmosphere.

Podré intercambiar ideas sobre cómo el cambio climático podría afectar a la Tierra y a mi comunidad, diseñar un experimento en papel para poner a prueba mis ideas, explicar algunos de los efectos del calentamiento global, comprender circuitos de retroalimentación positivos y negativos y comprender y evaluar las limitaciones de los modelos para estudiar el cambio climático a través del tiempo. Haré esto a través de una discusión grupal, creando un póster y escribiendo un diseño de experimento en papel que podría poner a prueba un aspecto del cambio climático. Usaré vocabulario como precipitación, vida vegetal y atmósfera.

Climate Change Unit

Activity 6 p. E136

In Schoology, course Earth Science 2, folder Unit 6 Climate Change, folder Week 5, folder Activity 6,

1. proceed to the assignment Climate Change Activity 6 Notes & Questions,
2. open the attached document,
3. complete the What do you see? and Think about it sections (Schoology discussion), and
4. be prepared to discuss as a whole class.

En Schoology, curso Earth Science 2, carpeta Unidad 6 Cambio climático, carpeta Semana 5, carpeta Actividad 6,

1. proceder a la tarea Actividad 6 sobre Cambio Climático, Notas y Preguntas,
2. abra el documento adjunto,
3. completa el ¿Qué ves? y Piénsalo secciones (discusión en Schoology), y
4. prepárate para discutir como una clase completa

IWBAT brainstorm ways climate change might affect the Earth and my community and explain some of the effects of global warming.

Climate Change Unit

Activity 6 p. E136

After the discussion:

- Complete steps 1-2 of the Investigate as a table group.
 - All partners must be listed in all partners' documents
 - All partners must list the remaining ideas on step 2
- The poster paper for for step 2 is available on the tan cabinet.

Después de la discusión:

- Complete los pasos 1-2 de Investigar como un grupo de tablas.
 - Todos los socios deben figurar en todos los documentos de los socios
 - Todos los socios deben listar las ideas restantes en el paso 2
- El papel de póster para el paso 2 está disponible en el gabinete de bronceado.

IWBAT brainstorm ways climate change might affect the Earth and my community and explain some of the effects of global warming.

Climate Change Unit

Activity 6 p. E138 Digging Deeper

- The world's climate is becoming warmer as a result of GHGs. It's hard to say for sure whether the global average temperature is increasing. Remote sensing of land and water temperatures by satellites makes it easier to measure currently, but such technology didn't exist in the past. It is known that there have been large variations in global temperatures on the scale of centuries and millennia long before humans began releasing huge quantities of GHGs.
- Scientists who study global warming use complicated computer models to try to predict what might happen. The physics of clouds are an especially important but especially uncertain factor. The workings of the atmosphere are much more complex than any computer model.
- Many factors influence the climate on Earth including GHGs, Milankovitch cycles, volcanic activity, weathering of rocks, ocean currents, and positions of continents. Scientists don't fully understand how these factors interact with each other making it difficult to make predictions about how the atmosphere responds to particular changes. These responses are called feedback loops.
- Positive feedback occurs when two factors operate together and their effects add up: cooler temperatures & ice build up (reflecting solar energy) leading to more cold & ice
- Negative feedback occurs when two factors operate in opposition and their effects moderate each other: weathering reduces CO₂, but less CO₂ reduces weathering

IWBAT understand positive and negative feedback loops and understand and evaluate the limitations of models in studying climate change through time.

Climate Change Unit

Activity 6 p. E138 Digging Deeper

- The uncertainty about feedback loops is one thing that makes it hard to predict how Earth's climate might react to an increase in CO₂. Warmer temps cause more evaporation and more clouds. Clouds reflect sunlight (cooling) and hold in heat from Earth's surface (warming).
- Scientists continue to work on computer models of global climate. The models show possible scenarios from the increase of GHGs in the atmosphere.
- Some models predict more rain with global warming while others predict a change in rainfall patterns (more in winter, less in summer). Extreme weather events such as snowstorms and hurricanes may increase with the increase in evaporation brought on by warmer temperatures.
- Glaciers around the world have been shrinking in recent years. The warmer the Earth's climate, the more glacial ice sheets will melt. The meltwater returning to the ocean can raise sea level by as much as a meter by the year 2100.
- Agriculture would be affected by changes in rainfall patterns. Places could be too wet or too dry to support current crops. Another change that would affect productivity would be wetter winters and drier summers.
- The addition of fresh meltwater from glaciers into the north Atlantic could disturb the North Atlantic Deep Water current. Since ocean currents distribute solar energy around the world, a disruption could have effects around the globe.

IWBAT understand positive and negative feedback loops and understand and evaluate the limitations of models in studying climate change through time.